

*Original Article***The effect of physical exercise on physical and psychological problems**

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Abstract

BACKGROUND: Despite therapeutic effect of hemodialysis in end stage renal disease (ESRD) patients, these patients encounter different physical and psychological tensional factors. Physical exercises have beneficial physical and psychological effects on patients under hemodialysis as one of the accessory therapeutic methods. As few studies have been done about the effects of physical exercise on physical and psychological problems in Iran than other countries, we assessed the effect in patients under hemodialysis.

METHODS: For this purpose, 43 qualified hemodialysis patients receiving hemodialysis in hospitals of Tabriz University of Medical Sciences were included, but only 35 patients did the exercises for 8 weeks completely. Exercise program was done for 1 hour every session and was composed of ergometer, treadmill and ball playing. Before and after intervention data were collected by interview through a synthetic and adjusted questionnaire. At the end of the intervention, two special questions were added about the improvement of physical and psychological problems. Paired t-test was used to compare the scores of before and after intervention.

RESULTS: There were significant differences between scores of before and after intervention considering physical problems including sleep, pain and discomfort, daily activities, and physical function; but about sexual activity, there was not a significant difference between scores of before and after intervention. Psychological problems improved after doing exercises too. About first special question, 85.6% of patients expressed an improvement in physical conditions and about second special question, 91.4% of patients expressed an improvement in psychological conditions.

CONCLUSIONS: Since physical exercise improves the physical (physical function, daily activities, pain and discomfort, sleep), and psychological problems, it is suggested that responsible people prepare equipment for these patients, until they do exercise forever. Nurses would present them the ways of a correct exercise, and doing it in days after hemodialysis, in order to improve physical, and psychological problems in hemodialysis patients, and finally to enhance their quality of life.

KEY WORDS: Hemodialysis, physical factors, psychological factors, physical exercise.

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Chronic renal failure (CRF) is a progressive damaging and irrevocable disturb of renal function in which the body ability in preserving metabolism and water/electrolyte balance would decrease, and so uremia is made.¹ The main treatment of end stage renal disease (ESRD) is kidney transplantation, but finding a suitable kidney for transplantation is not easy in most parts of the

world, so the patients should undergo dialysis. More than 60,000 people die annually because of kidney failure all over the world. In a study which was done in 1988, the number of patients under hemodialysis was reported to be 517,000.² This universal number had raised to 1 million in 1992.³ According to the available statistics in Iran, 1200 to 1600 people become affected by this disease, annually.⁴ The number

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of patients under hemodialysis has been reported to be 4873 people till the end of 1993, 6000 people till the end of 1996, 10276 people till the end of 2003, and 15,000 people till the end of 2004 in Iran, and 1394 people till the end of August 2005, in our province (East Azerbaijan) by the association of support for renal patients.⁵⁻⁷ Hemodialysis is a technological therapeutic procedure used to treat end stage renal disease (ESRD). Despite therapeutic effect of hemodialysis in ESRD, the patients encounter different physical and psychological tensional factors that are uncontrollable.⁸ Uremic symptoms, nonuremic disorders, problems in daily activity, and physical function, and other problems that are induced by therapeutic procedure, are the major problems in hemodialysis patients.⁹ Lancaster said that hemodialysis patients encounter different tensional factors such as family problems, sexual dysfunction, dependency to others in continuing life, social seclusion, change in body image concept, psychological tensions, and threaten to death.¹⁰ Bahraminejad quoted from Godvin that physical problems such as exhaustion, sleep disorders, and sexual dysfunction are the most important ones in hemodialysis patients.² Many studies have showed that hemodialysis patients encounter many complications such as hypertension, loss of appetite, anemia, disturbance of concentration, kidney osteodystrophy, abnormal menstruation, skin disorder such as itching, infection of fistula, and skeletal and muscle pain.¹¹ In addition of physical problems, psychological disorder in these patients are reported to be 22.4% to 51.6%.¹² Bahraminejad quoted from Karts and Vake that the most prevalent psychological problems in hemodialysis patients are depression and anxiety. Anxiety in these patients is derived from dread from death, tension, worriness, and many different changes in their lifestyles. Most of the anxiety patients are depressed.² Several reports have shown recently that physical exercises have had beneficial physical and psychological effects on dialysis patients as one of the lateral therapeutic methods.¹³ In Koufaki et

al study, it was showed that physical exercises would improve functional capacity in ESRD patients.¹⁴ In Kouidi et al study hemodialysis patients, it was identified that after 6 months aerobic physical exercises including walking and cycling there was a significant decrease in their depression scores and a significant enhancement in their quality of life was seen.¹⁵ In a study by Suh et al in Korea, it was showed that doing physical exercise for 12 weeks as moving on treadmill and ergometer wheel on 14 hemodialysis patients has increased quality of life significantly.¹⁶ Other studies showed that physical exercise have many benefits for hemodialysis patients such as increasing hematocrite, hemoglobin, and reticulocyte, decreasing systolic and diastolic blood pressure and blood triglycerids, improvement of level of plasma insulin and improvement of some aspects of psychological problems.¹⁷

Physical and psychological problems in hemodialysis patients can lead to the decrease of their quality of life. Quality of life is one of the concepts accepted as a criterion for examination of the results of treatment and patient's state who have physical and psychological disorder.¹⁸ Testa et al described effective aspects of quality of life such as physical, social and psychological domains of health which are impressed by individuals' experiences, beliefs, expectations and perceptions.¹⁹ According to the mentioned matters, hemodialysis patients encounter many physical and psychological problems such as sleep disorders, pain and inconvenience, sexual problems, and depression. Several studies have showed that aerobic physical exercise three times per week, would have positive effects in decreasing problems of hemodialysis patients, but a few studies have been done on the effects of physical exercise on psychological problems and specially on the different physical problems in hemodialysis patients. Since no study was done about this ground in Iran community, we assessed the effects of physical exercises on physical and psychological problems in hemodialysis patients.

Methods

The present study was a clinical trial one done in Teaching hospitals of Tabriz University of Medical Sciences. The study population was all patients under hemodialysis treatment in hemodialysis wards of Imam Khomeini and Sina hospitals surveyed. All patients who had the study criteria were enrolled consecutively. The inclusion criteria were as following; patients who were under hemodialysis treatment twice or 3 times a week for at least three months,¹⁶ their hemoglobin level was more than 8 mg/dl, they could walk without others help, they had enough musculoskeletal strength for doing exercises. The exclusion criteria were coronary artery diseases and arrhythmia (for this reason, patients were tested by exercise test), severe physical and psychological problems that would prevent their cooperation like multiple sclerosis (MS), schizophrenia, cerebrovascular accident (CVA), systolic blood pressure over 200 mmHg, using anti-depressant drugs during study and inability to do or continue physical exercises for any reason.

Data collection techniques: Survey units were selected based on inclusion criteria. All patients were interviewed to fill out the questionnaire of physical and psychological problems that was prepared for mental inspection (this questionnaire was prepared by combining the physical and psychological aspects of standardized questionnaires such as SF-36 and kidney disease quality of life questionnaire). Evaluated psychological problems were worryness, hope to future, sadness, happiness, and irritation. Physical problems were composed of five parts; physical function, daily activities, pain and discomfort, sleep, and sexual issues. It was validated through content validity and the reliability was calculated using Cronbach's alpha. Then patients were scheduled exercise program on days that they were not under dialysis. At the end of the intervention, they filled out the same questionnaire as before and also filled out the two special questions that were measured by lickert criterion; 1. How much had the physical exercise improved the physical problems, 2. How

much had the physical exercise improved the psychological problems (increasing happiness, and decreasing anxiety...). The collected data were analyzed by SPSS software (descriptive and inferential statistic).

Study's environment: Study environment was the hemodialysis wards of Imam Khomeini and Sina hospitals of Tabriz University of Medical Sciences.

Physical exercise program: Male patients did physical exercises with male trainers and female patients with female trainers. Physical aerobic exercises were done for 8 weeks (three times every week). Exercise program was done for 1 hour every session and included ergometer, treadmill and ball playing (the patients selected one or all of them every session). This Exercise program was aerobic. In every session before starting exercises, patients vital signs (blood pressure, pulse and respiration) were controlled by technicians (they controlled their pulse during exercises, too), then patients warmed up by walking around arena for 10 minutes and doing tensional movement and at the next step, they pedaled by ergo meter, moved on treadmill, or did ball playing, they did them by periodical relaxation for 40 minutes (the time of relaxation was free for each one) and they chilled their body like warming up finally. The exercise program was done under supervision of emergency's technicians. The patients, who confronted any problems, were cured by technicians, but if the problem was serious, they were sent to hospital.

Results

At first, exercise program was done for 43 qualified hemodialysis patients, but eight of them abandoned study in different stages for different reasons. The mean age of patients was 45.47 ± 15.16 and the age rang was 16-80 years. Most of the patients were male (%80), married (%71.4), and jobless (%68.6). 62.9 percents of patients were educated in elementary and primary school, 60 percents were under dialysis three times a week. 82.9 percents did not have the experience of kidney transplantation, 47

Table 1. Physical and psychological problems in hemodialysis patients before and after intervention

| Physical problems | Before Physical exercise | After Physical exercise | P value |
|-------------------------|--------------------------|-------------------------|---------|
| Physical function | 38.6 ± 7 | 48.8 ± 2.8 | < 0.001 |
| Pain & discomfort | 14.2 ± 3.6 | 16.4 ± 1.3 | 0.001 |
| Daily activity | 3.3 ± 1.4 | 5.1 ± 1.6 | < 0.001 |
| Sexual issues | 7.4 ± 2.9 | 8.1 ± 2.7 | 0.35 |
| Sleep | 19.6 ± 4.6 | 26.4 ± 3.8 | < 0.001 |
| Total Physical problems | 80.7 ± 10.8 | 100.9 ± 7.4 | < 0.001 |
| Psychological problems | 32 ± 6 | 38.7 ± 6.4 | < 0.001 |

percent under hemodialysis for 1-5 years, 91.5 percents did not have the regular exercise program before of this study.

For comparing the scores of before and after intervention, the paired t-test was used. About physical problems including sleep, pain and discomfort, daily activities, and physical function, there were significant differences between scores of before and after intervention, but in sexual activity, there was not any significant difference between scores of before and after intervention. The results showed that psychological problems improved after doing exercises too (Table 1).

About first special question, 85.6 percent of patients mentioned an improvement in physical conditions, and only 14.4 percent of them didn't express any improvement. About second special question, 91.4 percent of patients expressed an improvement in psychological conditions, and only 8.6 percent of them didn't express any improvement (Table 2).

Discussion

The results showed that regular aerobic physical exercise had beneficial effects on decreasing the physical problems in hemodialysis patients. For example it was distinguished that physical exercise lead to improve in "physical function" and "daily activities". Hemodialysis patients face to many problems such as: muscular

weakness, fatigue, muscular contraction that may affect their physical function and daily activities. Muscular weakness and atrophy are induced by many factors such as: malnutrition, uremic myopathy, neuropathy, accumulation of toxic matters in muscles, and decreasing of circulation in musculoskeletal system. In the other side, several studies have showed that regular aerobic physical exercise in the days after hemodialysis can improve musculoskeletal function by increasing blood circulation and repelling the toxic matters from muscles, so it lead to improve physical function and daily activities in hemodialysis patients.¹³ In another study by Naish, it was shown that physical exercises would enhance musculoskeletal strength.²⁰ Other studies have showed that exercise program (without using erythropoietin) can increase blood hematocrit. Also it can increase the ejection fraction and improve the heart output.¹³ So with improving musculoskeletal function, increasing blood hematocrit, improving ejection friction and heart output, we can expect that "physical function" and "daily activities" will be improved.

The result showed that physical exercise can improve the sleep pattern in hemodialysis patients. In view of the fact that after physical exercise, the patients have tired feeling, weakness, and sleepy, we can expect that it would facilitate the sleep of the hemodialysis patients.²¹

Table 2. Percentage of response to various phrase of special questions

| Special questions | Different response for special questions | | | |
|-------------------|--|-------------------|-------------------|----------------|
| | Hasn't improved | A little improved | Moderate improved | A lot improved |
| First question* | | | | |
| Number (percent) | 5 (14.4%) | 7 (20%) | 8 (22.8%) | 15 (42.8%) |
| Second question** | | | | |
| Number (percent) | 3 (8.6%) | 4 (11.4%) | 7 (20%) | 21 (60%) |

* How much does physical exercise improve the physical problems?

** How much does physical exercise improve the psychological problems?

Nieman said that people, who do exercise regularly, would sleep better and feel tiredness less than others during the day.²² In another study by King in Stanford University, he divided some old people who did not exercise before in two groups (case and control); the control group did aerobic and calisthenics exercise in form of walking 30–40 minutes every day for 16 weeks. His results showed that physical exercise caused a high quality sleep, longtime sleep, and need a little time to go to sleep.²³

The result showed that physical exercise can improve "pain and discomfort" in hemodialysis patients. They experience a different pain and irritation that cause to discomfort in them. There are several reasons for pain. One of the most prevalent of the patients' pains is musculoskeletal pain that is produced by accumulation of toxic matters, the decrease of circulation in musculoskeletal system, and misbalancing of water and electrolytes.²⁴ It seems that regular physical exercise can improve their pain through increasing of circulation and repelling the toxic matters from muscles.

Sexual problem was the only physical problem that did not improve significantly after regular aerobic physical exercise. Other studies have showed that physical exercise improved the sexual issues. For example the researchers of general schools of Harvard in an inquiry on 31000 male, showed that the people who did regular physical exercise had 30% less erectile disorders than those who were inactive. Also the women, who did regular physical exercise, had better sexual function. In that study, it was cleared that, 20 minutes regular and daily physical exercise had lead to more suitable sexual response in the women.²⁵ Improvement of sexual function in hemodialysis patients is impressed by the physiological and psychological factors; physical exercise is one of the methods that can improve the sexual function in hemodialysis patients. Although in this study sexual function has been improved, but it was not statistically significant. It seems that physical exercise would continue for a long term than 8 weeks, until it can be effective statistically.

Our result showed that most of the patients

stated an improvement in "Physical situation" after physical exercise; even half of them said that it was very high. Clase et al showed that exercise program could enhance physical state.²⁶ Since several studies showed the beneficial effects of physical exercises such as improvement of musculoskeletal strength, increase of hematocrit, recovery of anemia, decrease of LDL, improvement of daily activities, improvement of neuromuscular function, and improvement in the circulation of small blood vessels in hemodialysis patients, we can expect that physical exercise can improve "Physical situation" in them.

About the psychological problems and second special question "Do the hemodialysis patients express any improvement of psychological problems?", the results showed that the scores of psychological problems in hemodialysis patients increased significantly after regular aerobic physical exercise. Also most of them expressed an improvement in "Psychological situation" after physical exercise; even more than half of them said that this effect was very high. It seems that as 91.5 percents of survey units were not following a particular exercise program, adding a regular exercise program to their daily life and appeared happiness in consequence of it, would recover psychological problems in these patients. Namazizadeh wrote that physical exercises had many beneficial effects; one of them is in the fields of psychological and social problems; It removes worries, isolation, hopelessness and fear; It cause the balance of competition and acceptance of principles and standards in daily life; It makes happiness and gladness that are necessary for continuing and improving of life.¹⁷

By attention to the results of the present study, that physical exercise improves the physical problems (physical function, daily activities, pain and discomfort, and sleep), and psychological problems (worrieness, hope to future, sadness, happiness, irritation), it is suggested that responsible people prepare enough equipment and sport place to these patients. Patients should be informed about the importance of exercise and educated a correct and undange-

rouse way of exercise, and doing it in days after hemodialysis, in order to improve of physical, and psychological problems in hemodialysis patients, and finally enhance their quality of life.

Nurses as people who have a key role in treatment of patients, can help them to improve and care their health by encouraging them to do exercises. Researchers have shown that a body which is inactive or is not so active is in discomfort physically or psychologically. So physical exercises are one of the considerable matters for

nurses whose aim is, making physically and psychologically healthy feeling in their patients.²⁷ Nurses can perform an importance role in doing exercise in form of active (exercise is done by patient under nurse's supervision), as helper (when patient cannot do physical exercise individually and the nurse help her/him) or passive (is done by the nurse).

The Authors declare that have no conflict of interest in this study and ethical committee approved the study.

References

1. Tabatabaee F, Khatibi N, Hagazali M, Golsorkhi R. In translation of Cecil Internal medicine. 5th ed. Tehran: Eshtiagh Publisher; 2000. p. 348.
2. Bahraminejad N. survey of stressful factors and the way to contrast to them in hemodialysis patients who referring to the hospitals of the Tabriz university of medical sciences. [MSC Thesis]. Tabriz: School of Nursing and Midwifery, Tabriz University of Medical Sciences. 1994. p. 1-3. (Persian).
3. Hakim RM, Depner TA, Parker TF. Adequacy of Hemodialysis. *AM J Kidney Dis* 1992; 20(2): 107-23.
4. Kajbafzadeh M. Kidney transplantation. Tehran: Health ministry publishing; 1984. p. 24.
5. Oshvandi KH. The effect of self care education in decreasing problems in hemodialysis patients. [MSc Thesis] Tehran: Medical School, Tarbiat Modarres University; 1993. p. 1-3. (Persian).
6. Gutch CF, Stoner MH, Corea AL. Review of hemodialysis for nurses and dialysis personnel. Trans. Seirafi M. 6th ed. Philadelphia: Mosby; 1999. p. 22.
7. Fricke M. Renal failure and treatment; the guidance book for kidney disease patients and their family. Trans. Afshari L. Tehran: Teimorzadeh Publisher; 2002. p. 114-21.
8. Baldree KS, Murphy SP, Powers M. Stress identification and coping patterns in patients on hemodialysis. *Journal of Nursing Research* 1982; 31(2): 107-12.
9. Rittman M. Living with renal failure. *ANNA* 1993; 20(3): 101-7.
10. Lancaster LE. Impact of chronic illness over the life span. *ANNA* 1988; 15(3): 164-7.
11. Braz Pardijani SH, Mohammadi I, Bromand B. The effect of self care education on quality of life and physical problems in hemodialysis patients. *Journal of Kordistan University Medical Science* 2005; 10: 69-79.
12. Kimmel PL, Thamer M, Richard CM, Ray N. Psychiatric illness in patients with End Stage Renal Disease. *The American Journal of Medicine* 1998; 105, 214-21.
13. Kouidi E. Exercise training in dialysis patients: Why, when, and how. *International Society for Artificial Organs* 2002; 26(12): 1009-13.
14. Koufaki P, Mercer TH, Naish PF. Effects of exercise training on aerobic and functional capacity of end-stage renal disease patients. *Clin Physiol & Func Im* 2002; 22: 115-24.
15. Kouidi E, Iacovides A, Iordanidis P, Vassiliou S, Deligiannis A, Ierodiakonou C, Tourkantonis A. Exercise renal rehabilitation program: psychosocial effects. *Nephron* 1997; 77(2): 152-8.
16. Suh MR, Jung hH, Kim SB, Park JS, Yang WS. Effects of regular exercise on anxiety, depression, and quality of life in maintenance hemodialysis patients. *Ren Fail* 2002; 24(3): 337-45.
17. Namazizadeh M, Salahshor B. general physical upbringing. 7th ed. Tehran: Studying and writing of humanity science books Publisher; 1984: p. 4-6.
18. Kuehner C. Determining of subjective quality of life in depressed patients: the role of self esteem, response styles, and social support. *Journal of active disorders* 2005; 86: 205-13.
19. Testa M, Simonson D. Current concepts: Assessment of Quality of life outcomes. *The new England Journal of Medicine* 1996; 334(13): 835-40.
20. Sakkas GK, Sargeant AJ, Mercer TH, Ball D, Koufaki P, Karatzaferi C, Naish PF. Changes in muscle morphology in dialysis patients after 6 months of aerobic exercise training. *Nephrol Dial Transplant* 2003; 18(9): 1854-61.
21. Driver HS, Taylor SR. Exercise and sleep. *Sleep Med Rev* 2000; 4(4): 387-402.
22. Nieman DC, Facsm PH. Can exercise help me sleep better? *Acsms' Health & Fitness Journal* 2005; 9(3): 6-7.

23. King AC, Oman RF, Brassington GS, Bliwisi DL, Haskell WL. Moderate-intensity exercise and self-rated quality of sleep in older adults. A randomized controlled trial. *JAMA* 1997; 277(1): 32-7.
24. Davison SN. Pain in hemodialysis patients: prevalence, cause, severity, and management. *Am J Kidney Dis* 2003; 42(6): 1239-47.
25. Exercise: Key to good sex, good sleep. Available from: URL: <http://www.cnn.com/2006/HEALTH/diet.fitness/06/20/hb.exercise.benefits/index.html>.
26. Clase CM, Eager T, Moreland J, Depaul V. The effectiveness of aerobic and muscle strength training in patients receiving hemodialysis and EPO: a randomized controlled trial. *Am J Kidney Dis* 2002; 40(6): 1219-29.
27. Taylor c, Lillis C, Mone PL. *Fundamental of nursing: the art and science of nursing care*. 4th ed. Philadelphia: Lippincott Co; 2001. p. 618-42.